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(54) **Compaction material for synthetic lawn, process for its production and use**

(57) The present invention relates to a compaction material for synthetic lawn which comprises a thermoplastic elastomer and to a process for preparing it. Furthermore, the present invention relates to the use of said material to give elasticity to a synthetic lawn. The preferred material comprises a styrene block elastomer, ethylene-vinyl acetate copolymer, paraffin oil and calcium carbonate as a filler.

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Description

[0001] The present invention relates to a compaction material for a synthetic lawn and to a process for preparing it. Furthermore, the present invention relates to the use of said material to give elasticity to an artificial or synthetic lawn.

[0002] Floorings for sports grounds consisting of synthetic lawns made of fibers, for instance polypropylene fibers connected onto a support, for instance by knotting, have been known for a long time.

[0003] The kind of flooring now described, made of fibers knotted or connected onto a support, can withdraw given amounts of silica sand. The sand used has a controlled granulometry that can spread uniformly among the fibers constituting the synthetic lawn and keep them in vertical position, so as to give the sports ground the aspect of a real "natural lawn".

[0004] The aforesaid flooring for sports grounds made of a synthetic lawn and sand as compaction material, is an extremely stiff flooring, which can sometimes be dangerous for players performing sports activities. As a matter of fact, the high stiffness of the surface made of synthetic grass and sand cannot protect the joints of the players' legs and neither can it soften and reduce the damages which said players can get if they fall down during sports activities due to the low shock absorption of said lawn.

[0005] In order to overcome the drawbacks due to a high stiffness of the surface made of synthetic grass and sand particular grounds containing particular compaction materials have been developed.

[0006] It is known about the use of silica sand and granules of elastic material as compaction material for a lawn made of synthetic grass.

[0007] For instance, as elastic material natural or synthetic rubber in granular form, having a granulometry of about 0.05 to 2 mm, can be chosen.

[0008] It is known that a natural or synthetic rubber is a polymeric material with elastic properties that are typical of a thermosetting elastomeric material.

[0009] As a matter of fact, elastomer refers to a polymeric . material with an elastic behavior, i.e. recovering strains due to an external stress and bringing the final shape of the manufactured item always back to the starting shape, even when the aforesaid strains are very high.

[0010] Such description helps to distinguish the aforesaid elastomeric materials from plastic materials or "plastomers".

[0011] It is known that a thermosetting (or vulcanized) elastomer, commonly referred to as "rubber", has particular properties allowing its use in several applications.

[0012] For instance, a thermosetting elastomer undergoes an irreversible chemical modification (vulcanization) during its transformation to obtain a manufactured item (for instance car tires).

[0013] A thermosetting elastomer is at first in a liquid/viscous state and, after being reticulated, cannot be worked a second time, for instance for a possible subsequent use, since it cannot be brought back to the viscous state.

[0014] A thermosetting elastomer to be re-used at the end of its lifetime must necessarily be ground, thus limiting its possible use. Alternatively, said material can be disposed of in a dump or in a burner. For such reasons a thermosetting elastomer cannot be regarded as a recyclable or "ecologic" material.

[0015] The use of a compaction material comprising sand mixed with granules of natural or synthetic rubber has some drawbacks.

[0016] A first drawback consists in that synthetic rubber, for instance block styrene-butadiene rubber (SBR), has a low skin compatibility and can give rise to cutaneous intolerance or allergies.

[0017] Moreover, some vulcanized rubbers show a further drawback due to their black color. Such color limits the possibility of subsequently dyeing the compaction material with colors traditionally used for sports grounds such as green and white.

[0018] The possibility of dyeing with typical colors used in sports competitions is important in order to give the synthetic surface a higher naturalness and an appearance resembling more a real lawn for sports activities.

[0019] Furthermore, a compaction material made of natural or synthetic rubber is used as crushed material. Said material is obtained by grinding, chopping, shaking or cutting semifinished products made of rubber or manufactured items made of recycled rubber meant at first for a different use, such as for instance truck tires. Said working steps result in a ground material having a non-uniform granulometry value together with a fraction made of powder.

[0020] Therefore, a grinding or chopping step allows to obtain also a fraction made of rubber powder which, if used as compaction material for a synthetic lawn, has the drawback of forming a powder ground.

[0021] Another drawback of a compaction material made of natural or synthetic rubber is due to the fact that said material cannot be recycled and is a potential source of environmental pollution at the end of its lifetime.

[0022] Finally, as everybody knows, compaction materials made of synthetic rubber stink above all if the ground is placed in a hot climate.

[0023] Furthermore, compaction made with ground rubber obtained from recycled tires is a potential source of water pollution due to the release of heavy metals.

[0024] Eventually, we can therefore state that today it is known about the use of a thermosetting compaction material (for instance natural or synthetic rubber obtained by irreversible chemical reticulation, vulcanization) that has some drawbacks among which: negative anallergicity, dark color, evil smell (stinking) and non-recyclability at lifetime end.

[0025] Therefore, there is the need for a compaction material for a synthetic lawn that does not have the drawbacks of prior art.

[0026] In particular, there is the need for a compaction material for a synthetic lawn that has a reduced or absent toxicity, that is anallergic and recyclable.

[0027] Moreover, there is the need for a compaction material for a synthetic lawn whose size is constant and uniform and that has a granulometry greater than 0.5 mm so as to ensure a suitable laying of the synthetic surface without powder.

[0028] Furthermore, there is the need for a compaction material for a synthetic lawn having a reduced skin abrasiveness, that is waterproof, ozone-resistant, stable to UV rays so as to ensure the sports ground a long lifetime.

[0029] Finally, it is important that the compaction material is "ecologic", i.e. it can be recyclable and environmentally friendly.

[0030] The present invention therefore aims at carrying out a compaction material for synthetic lawns that is anallergic, not toxic for players and for the environment and recyclable.

[0031] Another aim of the invention is to carry out a compaction material for synthetic lawns that can be dyed with colors used in sports grounds, that has a uniform granulometry and is easy to use.

[0032] A further aim is to carry out a compaction material for synthetic lawns that can-be laid in mixture with sand or alternatively with another material (other than sand) made of polyethylene or polypropylene obtained from recycling operations, or alternatively with sand and recycled material.

[0033] A still further aim is to carry out a compaction material for synthetic lawns that can be laid alone, for instance by bedding onto a layer made of sand or alternatively onto a layer made of a polyethylene or polypropylene material obtained from recycling operations.

[0034] Still another aim is to carry out a compaction material for synthetic lawns with different granulometry values, which can be laid alone without using another material.

[0035] Another important aim is to carry out a compaction material for synthetic lawns whose density and elasticity degree can be varied according to needs without damaging the elasticity of its fiber and the laying of the synthetic lawn.

[0036] Finally, a further aim is to carry out a compaction material for synthetic lawns whose self-extinguishing degree and degree of smoke toxicity can be varied according to normative needs.

[0037] These and other aims that will be evident from the following detailed description are achieved by the Applicant who proposes a compaction material for synthetic lawn comprising an elastomer characterized in that said material comprises at least a thermoplastic elastomer.

[0038] A first object of the present invention is therefore a compaction material for synthetic lawn comprising an elastomer characterized in that said material comprises at least a thermoplastic elastomer.

[0039] A further object of the present invention is a process for preparing a compaction material comprising at least a thermoplastic elastomer, whose characteristics are listed in the enclosed independent claim.

[0040] The Applicant has found it useful to select among elastomeric polymeric materials thermoplastic materials.

[0041] Furthermore, elastomeric thermoplastic materials are molded at a given temperature in their viscous state and show their elastic properties simply thanks to cooling. Said materials, if necessary, can then be formed again by simply starting a new transformation cycle at a given temperature.

[0042] By way of summary we can say that thermosetting elastomers at the state of the art are obtained from an irreversible chemical reticulation and thermoplastic elastomers according to the present invention are obtained from a reversible physical reticulation (by cooling).

[0043] Advantageously, said thermoplastic elastomer are chosen among block styrene elastomers (SBC).

[0044] Preferably, said block styrene elastomers are hydrogenated.

[0045] Advantageously, said hydrogenated block styrene elastomers are chosen from the group:

- Styrene-Ethylene-Butylene-Styrene, (SEBS);
- Styrene-Ethylene-Propylene-Styrene, (SEPS);
- Styrene-Ethylene-Ethylene-Styrene, (SEEPS).

[0046] In a preferred embodiment of the present invention the thermoplastic elastomer further comprises at least a thermoplastic copolymer chosen from the group:

- Ethylene-Vinyl Acetate (EVA);
- Ethylene-Butyl Acetate (EBA).

[0047] Moreover, the thermoplastic elastomer can comprise in addition or alternatively a polymer chosen among polypropylene, polyethylene or other polyolefinic material.

[0048] Furthermore, said thermoplastic elastomer can comprise a diluting oil, lubricating and/or slipping additives, process additives, antioxidants, anti-UV filters.

[0049] Moreover, said thermoplastic elastomer can comprise an inert filler such as for instance calcium carbonate; preferably in an amount of 20 to 60% by weight with respect to the total weight of the compaction material.

[0050] A preferred embodiment of the present invention provides to carry out a compaction material for synthetic lawns that can be laid as a mixture comprising at least an elastomer according to the present invention,

sand and another recycled polyethylene or polypropylene material.

[0051] Another preferred embodiment of the present invention provides to carry out a compaction material for synthetic lawns comprising at least an elastomer according to the present invention and sand; alternatively, as a mixture comprising at least an elastomer according to the present invention, and another recycled polyethylene or polypropylene material, or a mixture comprising at least an elastomer according to the present invention, sand and another recycled polyethylene or polypropylene materia.

[0052] Another preferred embodiment of the present invention provides to carry out a compaction material for synthetic lawns comprising a layer made with at least a thermoplastic elastomer according to the present invention, said layer being laid alone by bedding onto another layer made of sand; or alternatively, onto a layer made with a polyethylene or polypropylene material obtained from recycling operations.

[0053] Another preferred embodiment of the present invention provides to carry out a compaction material for synthetic lawns consisting of at least a layer made with at least a thermoplastic elastomer according to the present invention, having a variable granulometry value; said at least one layer being laid alone without using the other material.

[0054] In a preferred embodiment the compaction material according to the present invention is in granular form, having the qualitative and quantitative characteristics mentioned above.

[0055] For instance, a given amount of sand having a given granulometry can be arranged onto a surface made of synthetic fibers.

[0056] Then a given amount of thermoplastic elastomer according to the present invention in granular form can be arranged onto said layer of sand, so as to obtain a compact layer.

[0057] Preferably, the granules of the thermoplastic elastomer have a diameter of 0.5 to 2.5 mm.

[0058] In a preferred embodiment the compaction material can comprise an elastomeric material according to the present invention having two different granulometry values.

[0059] The amount of thermoplastic elastomer used as compaction material varies according to the elastic properties to be given to the sports ground.

[0060] A further object of the present invention is a method for giving elasticity to a synthetic lawn, whose characteristics are listed in the enclosed independent claim.

[0061] In practice, in an embodiment the Applicant has improved a method for giving elasticity to synthetic lawns comprising an inorganic material, such as for instance silica sand or quartz sand with controlled granulometry, which provides for a step consisting in introducing directly among the fibers constituting the synthetic grass of a lawn the thermoplastic elastomer in granular form according to the present invention.

[0062] In a second embodiment the Applicant has improved a method for giving elasticity to synthetic lawns, which provides for a step consisting in introducing directly among the fibers constituting the synthetic grass of a lawn only thermoplastic elastomer in granular form according to the present invention.

[0063] The amount of elastomer that is introduced is of 5 to 30 kg/square meter of ground.

[0064] The elastomeric material according to the present invention has the peculiar characteristics of an elastic material that justify its use for compacting synthetic lawns: deformability, recovery of strains, shock absorbing power, rebounding properties, draining properties and holding by surface friction.

[0065] Moreover, the elastomeric material according to the present invention has a high degree of elasticity and of shock absorbing power so as to be skin-friendly or anyway not irritating in case of skin contact - also violent - and anallergic.

[0066] A further object of the present invention is a process for preparing the elastomeric material.

[0067] A given amount of at least a thermoplastic elastomer is introduced into a container of a blade mixer; preferably in an amount of 5 to 30% by weight with respect to the total weight of the compaction material.

[0068] Then a diluting oil can be added, for instance a paraffin oil; preferably in an amount of 10 to 30% by weight. Simultaneously, the mixing step can be started so as to enable the dilution of the elastomer with said oil.

[0069] Once the dilution is carried out, the other components are then added:

- a thermoplastic copolymer, for instance EVA, in an amount of 5 to 40% by weight;
- additives, such as process antioxidants, compatibility agent, lubricating agent and dispersing agent, other antioxidants and anti-UV filters.

[0070] The inorganic filler can further be added, such as calcium carbonate in an amount of 20 to 60% by weight. Said inorganic filler can be alternatively introduced laterally with respect to the extruder directly into the melted material after plasticization.

[0071] The mixture of the various components thus obtained is further homogenized in the blade mixer and then introduced into a compounding extruder. Within the extruder said mixture plasticizes and is ultimately homogenized to be divided into doses, extruded and granulated by means of cutting systems. The material obtained from the process described above is the compaction material according to the present invention.

[0072] The elastomeric material according to the present invention, thanks to the process for its preparation, has a granule surface (surface quality) and an intrinsic sericeous quality (intrinsic characteristic of the material) that make it less abrasive with respect to a thermosetting vulcanized elastomer, and anyhow not

slipping also in case the sports ground is wet or soaked. Furthermore, by suitably dosing the various components and additives it is possible to obtain a self-extinguishing compaction material.

[0073] The elastomeric material according to the present invention can be used to compact all types of sports grounds requiring surfaces with elastic properties.

EXAMPLE OF COMPACTION MATERIAL

[0074]

- Thermoplastic elastomer Styrene-Ethylene-Butylene-Styrene (SEBS) or (SEPS) 11% by weight, with respect to the total of the compaction material;
- Thermoplastic copolymer Ethylene-Vinyl Acetate (EVA) 10% by weight;
- Diluting paraffin oil 21% by weight;
- Calcium carbonate 52% by weight;
- Compatibility/Dispersing agent 0.5% by weight;
- Antioxidant 0.2% by weight;
- Lubricating agent (wax) 0.3 by weight; and
- Dye (green) 5% by weight.

Claims

1. Compaction material for synthetic lawn **characterized in that** said material comprises at least a thermoplastic elastomer.

2. Material according to claim 1, **characterized in that** said elastomer is chosen among block styrene elastomers.

3. Material according to claim 2, **characterized in that** said block styrene elastomers are not hydrogenated.

4. Material according to claim 2, **characterized in that** said block styrene elastomers are hydrogenated.

5. Material according to claim 4, **characterized in that** said elastomer is a block styrene elastomer chosen from the group:

   - Styrene-Ethylene-Butylene-Styrene, (SEBS);
   - Styrene-Ethylene-Propylene-Styrene, (SEPS);
   - Styrene-Ethylene-Ethylene-Styrene, (SEEPS).

6. Material according to any of the preceding claims, **characterized in that** it further comprises a thermoplastic copolymer chosen among:

   - Ethylene-Vinyl Acetate (EVA); and/or
   - Ethylene-Butyl Acetate (EBA).

7. Material according to any of the preceding claims, **characterized in that** it further comprises: polypropylene and/or polyethylene and/or other polyolefinic materials.

8. Material according to any of the preceding claims, **characterized in that** it further comprises:

   - a diluting-oil, preferably a paraffin oil;
   - additives, such as process antioxidants, compatibility agent, lubricating agent and dispersing agent, other antioxidants, anti-UV filters and dyes.

9. Material according to any of the preceding claims, **characterized in that** it further comprises an inorganic filler; preferably calcium carbonate.

10. Process for preparing the compaction material according to one or more claims 1 to 9, **characterized in that** it comprises at least a step in which the components are mixed so as to obtain a mixture and a step in which the mixture is extruded so as to obtain the compaction material in granular form.

11. Use of a compaction material according to one or more claims 1 to 9 for compacting a synthetic lawn.

12. Method for giving elasticity to a surface for sports activities comprising a synthetic lawn, **characterized in that** said method provides for the introduction among the fibers constituting the synthetic lawn of a compaction material according to one or more claims 1 to 9 so as to form a layer.

13. Method according to claim 12, **characterized in that** it provides for the introduction among the fibers constituting the synthetic lawn of a filling material, preferably sand, so as to form a layer before the introduction of the compaction material.

14. Method according to claim 12, **characterized in that** it provides for the introduction among the fibers constituting the synthetic lawn of a compaction material made of at least an elastomer according to claims 1 to 9.

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EUROPEAN SEARCH REPORT

Application Number
EP 02 42 5754

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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

C08L
A63C
E01C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	7 March 2003	Rodriguez, L

CATEGORY OF CITED DOCUMENTS

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